THE seventh volume of the Proceedings and Transactions of the Royal Society of Canada for the year 1889 includes, among other papers, the following: the cartography of the Gulf of St. Lawrence, from Cartier to Champlain, by W. F. Ganong; trade and commerce in the Stone Age, by Sir Daniel Wilson; expeditions to the Pacific, by S. Fleming; notes on mathematical physics, by J. Loudon; on the variation of the density with the concentration of weak aqueous solutions of certain salts, by J. G. McGregor; on new species of fossil sponges from the Siluro-Cambrian at Little Metis on the lower St. Lawrence, by Sir J. W. Dawson.

MR. C. C. VEVERS, Leeds, has published an illustrated catalogue of photographic apparatus, materials and catalogues, and optical lanterns and accessories.

MESSRS. R. FRIEDLÄNDER AND SON, Berlin, have just issued two catalogues of books which they have for sale, one relating to comparative anatomy, the other to *Arachnida, Myriopoda, Crustacea*, and *Rotatoria*.

BY authority of the Consul-General of Uruguay, London, a catalogue has been issued of the minerals from Uruguay shown at the recent International Exhibition of Mining and Metallurgy at the Crystal Palace. Associated with the catalogue are various allied documents, one of which is the mining code of the Republic.

COLONEL HOLABIRD, of Los Angeles, has lately returned to San Francisco from an exploring expedition in the cañons of Colorado. He penetrated districts never before explored, and found in an almost inaccessible cañon 100 miles north of Williams, and near the Grand Cañon of the Colorado, the Yava Supai tribe of Indians, who had never seen any white man, except Lee the Mormon, who was shot for the Mountain Meadows massacre. Colonel Holabird, in relating his experiences to a correspondent of the *New York Tribune*, said:—"These Indians are of the Apache family, but of ancient origin. The men are magnificent specimens. The valley in which the tribe has lived for many years in seclusion has only two ways of approach. It contains 2000 acres, and is inclosed by almost perpendicular walls 4000 feet high. We travelled over 15 miles along a cañon—a lifeless country. Suddenly we came to two boiling springs under cotton-wood trees. From these springs a river starts, which winds its way through a luxuriant valley. The water in the river is clear as crystal, and so strongly impregnated with lime that it petrifies everything it touches. There are three immense cataracts in the cañon. These look as if centuries ago a huge cotton-wood tree had fallen across the stream and lodged. Mosses, ferns, and creepers formed a barrier. All these have been turned to limestone. The grass caused the deposit to increase until the barricade extended across the cañon, making a fall of 250 feet. Along the front of these high cataracts, limestone ridges have formed 20 to 50 feet one above the other. Over all these the water falls like a sheet of glass. Underneath, between the ridges, thousands of plants, with flowers in full bloom, are seen, while millions of humming-birds dart in and out. The chief of the strange tribe is an old man of sixty—'Captain Tom.' I found these Indians in a starving condition, subsisting on berries and grass-seed. I appealed to the Government for them, but the Indian Department said it could not help wandering people."

THE November number of the *American Journal of Science* contains an account of the preparation of pure metallic cadmium, by the process of distillation *in vacuo*, recently carried out by Mr. E. A. Partridge in the laboratory of the University of Pennsylvania. The successful experiments described a few months ago by Messrs. Morse and Burton, in which it was shown that metallic zinc could be obtained in a state of purity by distillation at a high temperature in a vacuum constantly renewed by means of a Sprengel pump, led Mr. Partridge to make a similar attempt in the case of cadmium, with the ulterior purpose of utilizing such a sample of the pure metal for a redetermination of its atomic weight. The process has proved perfectly successful, and yields a metal of such purity that even spectroscopic examination fails to detect any traces of admixed foreign metals. The retorts employed were of glass—naturally of the hardest kind that could be procured. They were made of tubing of 20–25 mm. diameter, and at a distance of about 11 cm. from the closed end were drawn out into a neck of 12 mm. diameter, through which the volatilized metal passed into the receiving portion of the tube. This latter portion was finally drawn off in such a manner that it could be tightly connected with a treble-fall Sprengel pump. About a hundred grams of cadmium were introduced into the retort before drawing off, and after the latter operation had been performed the apparatus was exhausted by means of the pump, which was kept working during the whole period of the distillation. The retort was then heated in the combustion furnace in which it was supported, the temperature being so regulated that most of the liquefied metal ran back into the retort, only the more volatile vapours passing through the neck into the receiver. The distillation was continued until about sixty grams of metal had passed over, the operation lasting about an hour. The volatilized cadmium condensed partly in the bottom of the receiver in the form of a bar, and partly upon the upper portion and sides in the form of brilliant perfectly-developed crystals. The product was redistilled in a similar manner in order to minimize the risk of traces of foreign metals being carried over. The precaution, however, appears to be unnecessary, for the residue left after re-distillation of the greater portion was found to contain no trace of impurity when examined spectroscopically. The atomic weight of cadmium was determined by three distinct methods, the salts employed being prepared from this redistilled metal. In the first series the loss of weight on converting the oxalate into the oxide by ignition formed the basis of calculation, in the second series the loss of weight on converting the sulphate into sulphide by ignition in a stream of sulphuretted hydrogen, and in the third series the loss brought about on similarly converting the oxalate into sulphide. The mean values obtained for the atomic weight, when $O = 16$, from ten experiments in each series were respectively 111·80, 111·79, and 111·80. The final value deduced from the whole of the experiments is thus 111·8.

THE additions to the Zoological Society's Gardens during the past week include two Squirrel Monkeys (*Chrysothrix sciurea*) from Guiana, presented by Mr. E. Leech; a Brown Bear (*Ursus arctos*) from Russia, presented by Mr. W. H. Stuart; an English Wild Cow (*Bos taurus*, var.) from Bangor, North Wales, presented by Mr. G. W. Assheton-Smith; two Masked Weaver Birds (*Hyphantornis personata* ♂ ♀) from Abyssinia, a Short-winged Weaver Bird (*Hyphantornis brachyptera*) from Africa, presented by Commander W. M. Latham, F.Z.S.; a Viverrine Cat (*Felis viverrina*) from India, a White-crested Touracou (*Corythaix albo-cristata*) from West Africa, deposited; a —— Shrike (*Lanius lahtora*) from India, purchased.

OUR ASTRONOMICAL COLUMN.

MEASURES OF LUNAR RADIATION.—The Proceedings of the American Academy of Arts and Sciences (vol. xxiv.) contains an account of some measures of lunar radiation made by Mr. C. C. Hutchins by means of a new thermograph. This instrument consists of a single thermal junction of nickel and iron placed in the focus of a small concave mirror. The author finds that the condensing mirror fulfils the functions of multiplied junctions, while the single union rapidly attains thermal equilibrium. A

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comparison was made between the thermograph and a thermopile of forty-eight couples, the result being that the former was found about twelve times as sensitive as the latter. Measures of the radiating power of some rocks, mostly of volcanic origin, show a remarkable uniformity. If the radiation from a blackened surface of quartz be taken as 100, the lowest radiating power is possessed by common white pumice, and is represented by 71·3. The temperature at which the measures were made was near 100° C. The measures of lunar radiation were made with an arrangement similar to that of a Herschel's telescope with the thermograph in place of an eye-piece. The results of the experiments indicate that the heat which our planet receives from the moon is to that of the sun as 1 is to 184,560. Some observations were made during the lunar eclipse of January 28, 1888, for the purpose of determining whether our atmosphere allowed radiations from the heated lunar surface to pass through it. When the moon was in the penumbra, the reading of the galvanometer scale was 254·4, nineteen minutes before totality it was 11·2, eight minutes before totality it was 7·3, and the mean of thirty readings taken during the total phase gave the value 2·09. The inference drawn from these observations is, that all but a minute portion of the rays from the lunar soil and rock are cut off by our atmosphere, for it seems impossible to conceive that a surface like that of the moon, upon which the sun has been shining for many days, should suddenly cease to radiate when the sun's light is withdrawn. A comparison of lunar rays with solar rays reflected from various rocks shows that the selective absorption by the rocks is altogether insufficient to explain the great absorption of the lunar rays observed during the eclipse. An attempt has been made to construct a curve representing the change of transmission of lunar rays by our atmosphere with changes in the altitude of the moon. The measures show that our atmosphere, at the ordinary pressure, transmits 89·25 per cent. of the vertical lunar beam.

THE STAR D.M. + 33° 470.—The Rev. T. E. Espin announces, in *Wolsingham Observatory Circular*, No. 27, that this star (R.A. 11h. 28m. 16s., Decl. + 33° 38′, 1855), magnitude 9·2, was observed on November 7 as 7·5 magnitude. Hence the star is probably variable. The spectrum is that of Group II.

THE NYASSALAND REGION.

ON Tuesday evening, at the opening meeting of the new session of the Royal Geographical Society, Mr. H. H. Johnston read a paper on his recent visit to the region lying between Lakes Nyassa and Tanganyika. While Mr. Johnston dealt largely with matters bearing on British interests and the industrial development of the region, he was also able to make additions to our knowledge of its geography. Mr. Johnston, in H.M.S. *Stork*, sailed up the Chindé mouth of the Zambesi, and for some distance up the Shiré River, where he was transferred to the Lakes Company's steamer *James Stevenson*. He visited the well-known station at Blantyre, then sailed up the lake to Karonga, the British station on the north-west shore of the lake. After bringing the hostile Arabs to terms, Mr. Johnston went on across the plateau to the south end of Lake Tanganyika, visiting, by the way, Lake Hikwa or Rukwa, first seen by Mr. Joseph Thomson on his first expedition into Africa. Of the navigation of the Zambesi, Mr. Johnston said:—

"The navigation of the Zambesi from its mouth to Vicente is by no means an easy matter to those unacquainted with the intricate windings of the river's navigable channel. The great stream, which is, on an average, three or four miles broad, is studded with islands and beset with sand-banks. Vast stretches of the river are covered by scarcely more than six inches of water. To the eye of a man accustomed to the study of great rivers, the existence of these shallows is at once apparent by the mirror-like calm of the water that covers them, and the warm, pinkish tone of the sandy bottom which subtly permeates the blue reflections of the sky. On the other hand, the course of the deep channel is marked by the swirling water, the tiny whirlpools, and the sharply-cut sides of the bank, which, instead of tapering off into the stream, look as if they had been recently sliced with a large knife. There is a crying need for what at present does not exist, or, if it does, is not known to the outside world—a good, accurate, and detailed chart of the course of the Lower Zambesi. Although the course of the deep channel varies and alters, as it does in all great rivers, it does not generally change so quickly but that a little careful supervision might easily keep such a chart up to date."

The following account of what is to be seen on the Shiré is of interest:—

"Continuing the ascent of the Shiré, we skirt the strikingly picturesque range of the Pinda Mountains, all jagged peaks and sugar-loaves, on the east, and the Matunda Mountains on the west, while in the far, far distance northwards there rise the vast dim outlines of higher and higher peaks, culminating in Mount Tshiperoni (or 'Clarendon,' as it was named by Livingstone). The scenery on this stretch of the Shiré is really very fine. In the foreground there are the serpentine windings of the broad river through the great Morambala marsh, which is here and there dotted by little lakelets of clear blue water, but for the most part covered with wide stretches of tall reeds. These reeds bear large heads of creamy-white flower-tufts, almost as big as those of the pampas grass, and as the wind blows across the marsh it sways the reeds into wave-like undulations, wherein the great white heads of blossom appear like fluctuating foam cresting the billows of shining green leaf-blades beneath. Rising above this white-flecked sea of glistening grass are the abrupt ranges of fantastically-shaped hills and mountains, which girdle in the Shiré valley with great semicircles of blue mountain wall. Occasionally a glaucous-green Borassus fan-palm rises on a column-like stem from an island in the river or a dry patch in the marsh. These landscapes are drawn in large traits, and their harmonies are simple, and not complicated by the admixture of any human habitation or cultivation. It is not until one is within a relatively short distance of the Ruo that the banks of the Shiré begin to be inhabited again, and the marsh yields to thin forest and plantations of maize, tobacco, millet, and pumpkins.

"A short distance above the Ruo one enters the Elephant Marsh, a district of great grassy flats, flooded occasionally when the Shire overflows its banks, but ordinarily a dry level stretch of prairie dotted with pools of water.

"At the close of the dry season, when the tall grass has been burnt down, and there is little or no cover for the game to hide in, it is really a remarkable spectacle, as seen from the deck of a steamer, to watch the great herds of big animals wandering over these savannahs in search of the young verdure springing up amid the charred stubble of the old grass. With an opera-glass you may distinguish water-buck, gnu, buffalo, eland, pallah, reed-buck, and zebra, and occasionally some dark blue-grey blobs, much larger than the other specks and forms which are in their vicinity, turn out to be elephants. Occasionally a lion has been known to come down to the river and stare at the steamer, and on one or two occasions these beasts have actually been shot from the deck in passing. Both in the Elephant and Morambala marshes, and in the Upper Shiré, the hippopotamuses are a real source of danger and inconvenience to any boats of ordinary size which are not propelled by steam. The hippopotamuses are particularly dangerous at night, but even during the day they will deliberately chase and endeavour to upset boats and canoes which enter their domain; and in the development of the Shiré navigation it is essential that the hippopotamuses should be mercilessly exterminated."

Mr. Johnston described as follows the fine country on the north of Lake Nyassa:—

"Here there are no fewer than nine perennial rivers, some of them of considerable volume, which descend from the lofty mountain ranges of Buntali, Wukukwe, and Ukinga, and enter the lake between Karonga and Parumbira Bay, the moisture which percolates from them through the soil giving the Konde plain an appearance of perpetual spring. The land at the north end of the lake is a veritable African Arcadia. You may walk for miles and miles through banana plantations; then you may emerge on wide-stretching fields of maize and millet and cassava. All the oozy water-meadows are planted with rice; but, above all, the great wealth of the country is in cattle, which, elsewhere by no means common in Nyassaland, thrive remarkably in the Konde district, and consequently milk and beef are cheap and abundant. The inhabitants of this happy land are a contented, pleasant-dispositioned folk, who knew no trouble until the Arabs sought to subdue them a few years ago."

From a geographical point of view probably the most interesting part of his paper was that describing his visit to the remarkably desolate region around Lake Rukwa lying on the south-east of Lake Tanganyika. Rising from the fertile plateau are the

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